

### **Abstract of the Invention**

This invention relates to a process for the manufacture of aromatic  
5 carboxylic acids by exothermic liquid phase oxidation of an aromatic  
feedstock. More particularly, this invention relates to the efficient energy  
recovery of the exotherm produced by the liquid phase oxidation of an  
aromatic feedstock. An apparatus useful in recovery of energy from the  
preparation of aromatic carboxylic acids by the exothermic liquid phase  
10 reaction of an aromatic feedstock is described where the primary means of  
energy recovery is by raising moderate pressure steam. This is coupled  
with a process to recovery low temperature energy using a process  
commonly known as an organic Rankine cycle and/or a heat pump. The  
combination of energy recovery methods increases the overall energy  
15 recovery and enables the recovery of reaction energy as either thermal  
energy (steam) or work or a combination of both.

TABLE 2

Stream Name	304	305	306	307	308	309	310	501	502	503	504
Mass Flow lb/hr											
NITROGEN	5919	5908	11	5886	33	0	33	0	0	0	0
OXYGEN	270	269	1	267	3	0	3	0	0	0	0
WATER	3764	1551	2213	322	3442	0	3442	0	0	0	0
HOAC	47	19	28	6	41	0	41	0	0	0	0
PENTANE	0	0	0	0	0	0	0	8400	8400	8400	8400
Total Flow lb/hr	10000	7748	2252	6481	3519	0	3519	8400	8400	8400	8400
Temperature C	150.0	130.0	130.0	90.0	90.0		50.0	35.0	73.2	52.7	34.6
Pressure psi	145.2	144.2	144.2	143.2	143.2	141.2	141.2	44.3	43.3	15.0	14.0
Vapor Frac	1	1	0	1	0		0	0	1	1	0
Liquid Frac	0	0	1	0	1		1	1	0	0	1